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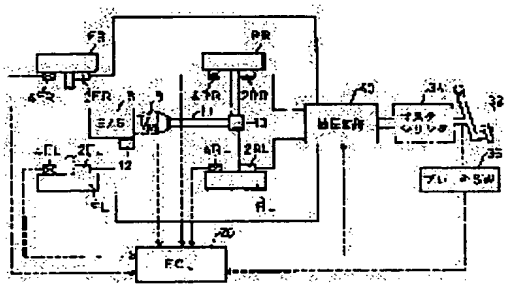
(54) VEHICLE BEHAVIOR CONTROLLER

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent a reduction in the side force of rear wheels and the occurrence of an unstable vehicle behavior caused by the movement of a load during engine braking in a rear wheel driven vehicle.
SOLUTION: In a rear wheel driven vehicle, during engine braking (110: YES), a deviation ΔV (=VR−VF) between the average wheel speed VR of rear wheels and the average wheel speed VF of front wheels is calculated (120 to 140) and, if the deviation ΔV is lower than a first determining value KH (positive value) (150: YES, 170: NO), the braking hydraulic pressure of the front wheel is gradually increased by ΔP (160). If the deviation ΔV is within a range of the first determining value KH to a larger second determining value KR, the braking hydraulic pressure of the front wheel is held (180: NO →190) and, when the deviation ΔV is larger than the second determining value KR, the braking hydraulic pressure of the front wheel is reduced (180: YES→200). Thus, during engine braking, a relationship between a front wheel braking force and a rear wheel braking force is controlled in the stable region of an ideal braking force distribution and the unstable motion of the vehicle following a reduction in the side force of the rear wheel is prevented.



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CLAIMS

[Claim(s)]
[Claim 1] The vehicles behavior control unit characterized by applying the wheel damping force by the brake fluid pressure to the wheel by the side of a front wheel according to load movement of the body by this engine brake when a driving wheel is in an engine brake state with reduction of driving force which joins a driving wheel in the vehicles which constitute the wheel by the side of a rear wheel as a driving wheel at least.
[Claim 2] The vehicles behavior control unit characterized by applying the wheel damping force which joins the aforementioned driving wheel by this engine brake, and the wheel damping force more than equivalent by the brake fluid pressure to the aforementioned coupled driving wheel when the aforementioned driving wheel is in an engine brake state with reduction of driving force which joins the aforementioned driving wheel in the vehicles which constitute the driving wheel and the front wheel for the rear wheel as a coupled driving wheel.
[Claim 3] The vehicles behavior control unit characterized by applying wheel damping force by the brake fluid pressure to the aforementioned coupled driving wheel so that the wheel damping force in the aforementioned coupled driving wheel may turn into more than the wheel damping force in the aforementioned driving wheel when the aforementioned driving wheel is in an engine brake state with reduction of driving force which joins the aforementioned driving wheel in the vehicles which constitute the driving wheel and the front wheel for the rear wheel as a coupled driving wheel.
[Claim 4] A wheel damping force generating means for it to be prepared in each wheel of vehicles, respectively, and to make each wheel generate the damping force according to the brake fluid pressure A brake fluid-pressure generating means to generate the brake fluid pressure given to each of this wheel damping force generating means, and a driving force generating means to generate the driving force for driving the wheel by the side of a rear wheel at least It is the vehicles behavior control unit equipped with the above, and is characterized by having a detection means to detect the aforementioned engine brake state, and the control means which operate the aforementioned brake fluid-pressure generating means, and a brake fluid pressure is applied [control means] to the wheel damping force generating means by the side of a front wheel, and make a vehicles front wheel generate damping force when an engine brake state is detected with this detection means.
[Claim 5] The aforementioned control means are vehicles behavior control units according to claim 4 characterized by generating the brake fluid pressure according to load movement generated into the body by this engine brake from the aforementioned brake fluid-pressure generating means, and adding to the wheel damping force generating means by the side of the aforementioned front wheel, when an engine brake state is detected with the aforementioned detection means.
[Claim 6] The aforementioned control means are vehicles behavior control units according to claim 5 characterized by controlling the brake fluid pressure which adds the aforementioned load movement to the wheel damping force generating means by the side of the aforementioned front wheel according to this degree difference of wheel speed judging from the degree difference of wheel speed of the degree of wheel speed of a front wheel, and the degree of wheel speed of a rear wheel.
[Claim 7] The aforementioned control means are vehicles behavior control units according to claim 6 with which the degree of wheel speed of a front wheel is characterized by forbidding increase of the aforementioned brake fluid pressure when small beyond a predetermined value [degree / of a rear wheel / of wheel speed].

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the vehicles behavior control unit which controls the vehicles behavior when the damping force by engine brake joining a driving wheel.
[0002]
[Description of the Prior Art] It had been said that the rotational speed of a rear wheel fell greatly to the degree of car body speed with the damping force which joins a rear wheel by engine brake while the as opposed to [if the driving force which joins a driving wheel conventionally by the rear drive vehicle, the four-wheel drive car, etc. and the vehicles from which the rear wheel of vehicles turns into a driving wheel at least decreases and a driving wheel will be in an engine brake state, a load will move ahead of the body, and] road surface of rear wheel grip force declines.
[0003] Therefore, in the vehicles which use a rear wheel as a driving wheel, at the time of engine brake, the rear wheel may have preceded with the front wheel, it may have lapsed into the slip inclination, the side force which a rear wheel demonstrates may have decreased, and it may have had a bad influence on the behavior of the body. That is, by this kind of vehicles, it becomes easy to generate spin etc. at the time of engine brake.
[0004] this invention was made in view of such a problem, and in the vehicles which use a rear wheel as a driving wheel at least, the side force of a rear wheel decreases by load movement at the time of engine brake, and it aims at preventing that vehicles behavior becomes unstable at it.
[0005]
[Means for Solving the Problem] In the vehicles which constitute the wheel by the side of a rear wheel as a driving wheel at least, the vehicles behavior control unit according to claim 1 made in order to attain this purpose is characterized by applying the wheel damping force by the brake fluid pressure to the wheel by the side of a front wheel according to load movement of the body by this engine brake, when a driving wheel is in an engine brake state with reduction of driving force which joins a driving wheel.
[0006] Namely, in the vehicles of a rear drive or a four-wheel drive, by applying the wheel damping force by the brake fluid pressure to the wheel by the side of a front wheel according to load movement of the body, the damping force which joins the front-wheel side of vehicles is increased, and the side force of a front wheel is reduced in a vehicles behavior control unit according to claim 1 at the time of engine brake.
[0007] Consequently, though the side force of a rear wheel falls with load movement at the time of engine brake, the side force of a front wheel can also be reduced according to this, the lateral force by the side of the front wheel of vehicles and a rear wheel can be made to balance, and it becomes possible to improve rolling-stock-run stability.
[0008] Especially, in a rear drive vehicle, although vehicles behavior becomes instability more compared with a four-wheel drive car and it becomes easy to carry out spin in order for damping force not to join a front wheel when a driving wheel (rear wheel) is in an engine brake state According to this invention (claim 1), since damping force is applied to a front wheel at the time of engine brake, the relation between front-wheel damping force and rear wheel damping force can be controlled to the stable zone of the ideal braking-force-distribution diagram shown in drawing 5 , rolling-stock-run stability can be improved, and the effect can be demonstrated more.
[0009] In addition, the ideal braking-force-distribution diagram shown in drawing 5 expresses the relation of the rear wheel damping force and front-wheel damping force which can make vehicles brake stably and promptly, rear wheel damping force becomes unstable [vehicles] in a large field from the braking force distribution specified by this ideal braking-force-distribution diagram, it becomes easy to generate spin etc., and vehicles express a stable state and a bird clapper in the field where front-wheel damping force is larger than this braking force distribution.
[0010] Moreover, the vehicles behavior control unit of this invention (claim 1) can also improve the controllability of the vehicles in the case (at the time of a **** run) of going down a slope, also being able to increase the vehicles

deceleration at the time of engine brake (deceleration), for example, braking with the engine at the time of engine brake, since rolling-stock-run stability is secured by applying damping force to a front wheel.
[0011] That is, if the stability at the time of engine brake is only improved, although increasing the driving force of a driving wheel, for example, and suppressing load movement will also be considered, the damping characteristic of the vehicles by engine brake is spoiled, at the time of the **** run using especially engine brake, the damping force by engine brake is insufficient, and brakes operation is needed as such a cure, for it. On the other hand, according to this invention (claim 1), since damping force is applied to a front wheel at the time of engine brake, vehicles deceleration can be increased. Therefore, it is not necessary to perform brakes operation frequently, and the controllability of vehicles can be improved now at the time of a **** run.
[0012] Next, in the vehicles (that is, rear drive vehicle) which constitute the driving wheel and the front wheel for the rear wheel as a coupled driving wheel, a vehicles behavior control unit according to claim 2 is characterized by applying the wheel damping force which joins a driving wheel by this engine brake, and the wheel damping force more than equivalent by the brake fluid pressure to a coupled driving wheel, when a driving wheel is in an engine brake state with reduction of driving force which joins a driving wheel.
[0013] for this reason, the case where damping force joins a rear wheel (driving wheel) by engine brake in a rear drive vehicle according to this invention (claim 2) -- the damping force and the wheel damping force more than equivalent -- a front wheel (coupled driving wheel) -- in addition, the relation between front-wheel damping force and rear wheel damping force can be controlled to the stable zone of the ideal braking-force-distribution diagram shown in drawing 5 , and the same effect as a vehicles behavior control unit according to claim 1 can be acquired
[0014] Moreover, when the vehicles behavior at the time of the engine brake in a rear drive vehicle is controlled and a driving wheel is in an engine brake state like a vehicles behavior control unit according to claim 2, a vehicles behavior control unit according to claim 3 is characterized by applying wheel damping force by the brake fluid pressure to a coupled driving wheel so that the wheel damping force in a coupled driving wheel may turn into more than the wheel damping force in a driving wheel.
[0015] That is, when a driving wheel is in an engine brake state, although the damping force by engine brake is added, damping force other than the damping force by engine brake may also join a driving wheel by an operator's brakes operation etc. Then, in this invention (claim 3), the total damping force of the driving wheel containing the damping force which joins a driving wheel, and the damping force more than equivalent are applied to a coupled driving wheel by engine brake at the time of engine brake.
[0016] Consequently, according to this invention (claim 3), compared with a vehicles behavior control unit according to claim 2, the relation between front-wheel damping force and rear wheel damping force is certainly controlled by the stable zone of the ideal braking-force-distribution diagram shown in drawing 5 , and it becomes possible to improve rolling-stock-run stability.
[0017] Moreover, next, a vehicles behavior control unit according to claim 4 The wheel damping force generating means prepared in each wheel of vehicles, respectively, and a brake fluid-pressure generating means to generate the brake fluid pressure given to each [these] wheel damping force generating means, In the vehicles equipped with a driving force generating means to generate the driving force for driving the wheel by the side of a rear wheel at least If the behavior of vehicles when the driving force which a driving force generating means generates decreases and a driving wheel changes into an engine brake state is controlled and an engine brake state is detected with a detection means Control means operate a brake fluid-pressure generating means, apply a brake fluid pressure to the wheel damping force generating means by the side of a front wheel, and make a front wheel generate damping force.
[0018] Therefore, according to the vehicles behavior control unit of this invention (claim 4), in the vehicles of a rear drive or a four-wheel drive, the damping force which joins the front wheel of vehicles at the time of engine brake is increased like equipment according to claim 1, the side force of a front wheel is reduced, by balancing the side force of order, it becomes possible to improve rolling-stock-run stability, and the same effect as equipment according to claim 1 can be acquired.
[0019] In addition, what is necessary is for control means to generate the brake fluid pressure according to load movement according to claim 5 which will be generated into the body by this engine brake if an engine brake state is detected with a detection means like from a brake fluid-pressure generating means, and just to constitute them in a vehicles behavior control unit according to claim 4, so that it may add to the wheel damping force generating means by the side of a front wheel.
[0020] Moreover, what is necessary is just to control the brake fluid pressure according to claim 6 which adds load movement to the wheel damping force generating means by the side of a front wheel like according to this degree difference of wheel speed judging from the degree difference of wheel speed of the degree of wheel speed of a front wheel, and the degree of wheel speed of a rear wheel by control means in this way, in order to generate the brake fluid

pressure according to load movement from a brake fluid-pressure generating means.
[0021] That is, when load movement occurs into the body by engine brake and the grip force over the road surface of a rear wheel declines, whether it is a rear drive vehicle or is a four-wheel drive car, the degree of wheel speed of a rear wheel falls rather than the degree of wheel speed of a front wheel with the damping force which joins a rear wheel by engine brake.
[0022] Therefore, load movement by engine brake can be judged from the degree difference of wheel speed of a front wheel and a rear wheel, and if the brake fluid pressure applied to a front wheel according to this degree difference of wheel speed is controlled, it can control the damping force which joins a front wheel by the brake fluid pressure according to the damping force which joins a rear wheel. Consequently, it becomes possible to control the lateral force produced in the front-wheel side of vehicles in the desired state corresponding to the lateral force produced in a rear wheel side, and it becomes possible to improve rolling-stock-run stability.
[0023] And it can also be prevented that will become large too much compared with the damping force with which the damping force according to claim 7 which will join a front wheel if the degree of wheel speed of a front wheel forbids increase of a brake fluid pressure beyond a predetermined value rather than the degree of wheel speed of a rear wheel like when small joins a rear wheel when controlling the brake fluid pressure of a front wheel, corresponding to the degree difference of wheel speed of a front wheel and a rear wheel especially in this way, and vehicles will become unstable.
[0024]
[Embodiments of the Invention] Hereafter, the example to which this invention was applied is explained using a drawing. Drawing 1 is an outline block diagram showing the composition of the whole control system of the rear drive vehicle with which this invention was applied first.
[0025] As shown in drawing 1 , for each wheel (the forward left ring floor line, the forward right ring FR, the left rear ring RL, right rear ring RR) of vehicles As a wheel damping force generating means to give damping force to each wheel floor line-RR, while hydraulic brake gear (henceforth wheel-cylinder:W/C) 2floor line, 2FR, 2RL, and 2RR are prepared, respectively Degree sensor of wheel speed 4floor line for detecting the rotational speed (henceforth the degree of wheel speed) of each wheel, 4FR, 4RL, and 4RR are prepared, respectively.
[0026] Moreover, the driving force (driving torque) of the vehicles outputted through a change gear (T/M) 8 from an engine 6 is distributed to the rear wheels (driving wheel) RL and RR on either side through a driveshaft 11 and a differential gear 10. And while the vehicles operator is operating the accelerator pedal in the engine 6, the accelerator switch 12 used as an ON state is formed in it, and the detecting signal from sensor 4floor-line-4RR etc. is inputted into an electronic control (henceforth ECU) 20 the detecting signal from this accelerator switch 12, and whenever [each wheel speed].
[0027] The master cylinder to which ECU20 carries out the regurgitation of the brake oil by treading in to a brake pedal 32 (It is hereafter called M/C) By controlling the various actuators in W/C2floor line of 34 to each wheel floor line-RR - the 2 hydraulic circuit 40 prepared in the oil pressure path which results in RR While performing the antiskid control which suppresses the slip produced for the wheel at the time of vehicles braking The engine brake state of the driving wheels RL and RR accompanying reduction of the driving force transmitted to driving wheels RL and RR from an engine 6 is detected. Vehicles behavior control which applies damping force to front wheels (coupled driving wheel) floor line and FR is performed by controlling the various actuators in a hydraulic circuit 40 at the time of engine brake.
[0028] In addition, ECU20 is constituted centering on the microcomputer equipped with CPU, ROM, RAM, etc., and the detecting signal from the brake switch 36 which will be in an ON (ON) state at the time of operation of a brake pedal 32 is also inputted into this ECU20. Next, a hydraulic circuit 40 is explained. In addition, this hydraulic circuit 40 is equivalent to the brake fluid-pressure generating means of this invention (it indicates to a claim 4).
[0029] As shown in drawing 2 , the hydraulic circuit 40 is equipped with two oil pressure paths 42 and 44 for supplying the brake oil fed from two oilways of M/C34, respectively to the forward left ring floor line, the right rear ring RR and the forward right ring FR, and the left rear ring RL. and to path 42RR which results in path 42floor line which results in W/C2floor line of the forward left ring floor line, and W/C2RR of the right rear ring RR in the oil pressure path 42 Electromagnetic reduced pressure control valve 48floor line for discharging the brake oil in the path 42floor line, electromagnetic boost control valve 46floor line which can be switched to the boost position which opens 42RR for free passage, and the maintenance position which intercepts the path, 46RR, and each W/C2floor line and 2RR, respectively, and 48RR are prepared.
[0030] moreover, in the oil pressure path 44, similarly to path 44FR which results in W/C2FR of the forward right ring FR, and path 44RL which results in W/C2RL of the left rear ring RL respectively -- the path 44FR and 44 -- boost control valve 46FR, 46RL, and electromagnetic every that can be switched to the boost position which opens RL for free passage, and the maintenance position which intercepts the path -- electromagnetic reduced pressure control valve

48FR for discharging the brake oil in W/C2FR and 2RL and 48RL are prepared
[0031] In addition, usually, boost control valve 46floor line, 46FR, 46RL, and 46RR serve as a boost position, and are switched to a maintenance position by the energization from ECU20. Moreover, usually, reduced pressure control valve 48floor line, 48FR, 48RL, and 48RR are a cut off state, will be in a free passage state by energization from ECU20, and will discharge the brake oil in corresponding W/C2floor line - 2RR.
[0032] On the other hand, it sets for the oil pressure path 42, and master cylinder cut bulb (henceforth SM valve) 50a which opens for free passage and intercepts the path is prepared in the path by the side of M/C34 rather than boost control valve 46floor line and 46RR. And when the oil pressure by the side of M/C34 becomes larger than the oil pressure by the side of boost control valve 46floor line and 46RR in parallel with this SM valve 50a, it is open for free passage, and relief-valve 54a which supplies the pressure oil outputted from M/C34 to the boost control valve 46floor line and 46RR side is connected.
[0033] Moreover, similarly, it sets for the oil pressure path 44, and SM valve 50b which opens for free passage and intercepts the path is prepared in the path by the side of M/C34 rather than boost control valve 46FR and 46RL. And when the oil pressure by the side of M/C34 becomes larger than the oil pressure by the side of boost control valve 46FR and 46RL in parallel with this SM valve 50b, it is open for free passage, and relief-valve 54b which supplies the pressure oil outputted from M/C34 to the boost control valve 46FR and 46RL side is connected.
[0034] In addition, the SM valves 50a and 50b are in the free passage state at the time of a power supply OFF, and are switched to a cut off state by the energization from ECU20. To the SM valves 50a and 50b, differential pressure regulating valves PRVa and PRVb are connected to parallel, respectively, and a flow of the brake oil by the side of W/C from M/C34 is forbidden, and each differential pressure regulating valves PRVa and PRVb permit a flow of the brake oil from a W/C side to M/C34, when the brake oil pressure by the side of W/C becomes high more than place constant pressure from the pressure by the side of M/C34. As this place constant pressure, that what is necessary is just to set it as 50atm-200atm, each differential pressure regulating valves PRVa and PRVb perform duct protection so that the inside of the duct by the side of W/C may not consist of SM valves 50a and 50b more than place constant pressure at the time of the regurgitation of the pumps 60 and 62 mentioned later.
[0035] In addition, although a duct in parallel with the SM valves 50a and 50b is formed and it is made to form differential pressure regulating valves PRVa and PRVb in this duct in drawing 2 , it may replace with such composition and the composition which builds the above-mentioned differential pressure regulating valves PRVa and PRVb in each SM valves 50a and 50b may be adopted as a differential pressure regulating valve which has relief ** (open pressure discharge) of place constant pressure for the valve element of the interception position of the SM valves 50a and 50b.
[0036] moreover, the reservoirs 56 and 58 in which the brake oil discharged from reduced pressure control valve 48floor-line-48RR is stored temporarily prepare for each oil pressure paths 42 and 44 -- having -- further -- the brake oil -- the path between SM valve 50a, and boost control valve 46floor line and 46RR, and SM valve 50b and the boost control valve 46 -- the path between FR and RL is equipped with the pumps 60 and 62 fed, respectively In addition, the accumulators 64 and 66 which suppress throb of internal oil pressure are formed in the regurgitation path of the brake oil from each pumps 60 and 62, respectively.
[0037] Moreover, at next, the time of execution of the vehicles behavior control later mentioned for each oil pressure paths 42 and 44 The oil supply paths 42P and 44P for supplying a direct brake oil to pumps 60 and 62 from the reservoir 68 formed in the upper part of M/C34 through M/C34 are established. The reservoir cut bulbs (henceforth SR valve) 70a and 70b which open for free passage and intercept the path are arranged by each [these] oil supply paths 42P and 44P, respectively.
[0038] In addition, usually, the SR valves 70a and 70b are cut off states, and are switched to a free passage state by the energization from ECU20. Moreover, each pumps 60 and 62 are driven through a motor 80 at the time of execution of an antiskid control and vehicles behavior control. Next, the antiskid control and vehicles behavior control which are performed by ECU20 are explained briefly. In addition, when not performing an antiskid control and vehicles behavior control, all the solenoid valves of a hydraulic circuit 40 are turned off (OFF), and drawing 2 expresses the non-control state.
[0039] ** By the antiskid control, for example, an operator's rapid brakes operation An antiskid control will be started if a slip is generated in each wheel floor line-RR. with SM valve 50a, 50b= free passage position (OFF), and SR valve 70a and a 70b= interception position (OFF) By driving a motor 80, operating pumps 60 and 62, and carrying out ON-OFF (un-energizing [energization and]) of boost control valve 46floor-line-46RR and the reduced pressure control valve 48floor-line-48RR further, respectively According to the slip state of each wheel floor line-RR, the brake oil pressure in each W/C2floor line - 2RR is suitably switched to the state of reduced pressure, maintenance, and a boost.
[0040] When it specifically judges that a wheel is in a lock inclination, while making boost control valve 46floor-line-46RR corresponding to the wheel intercept (ON), reduced pressure control valve 48floor-line-48RR is made to open for

free passage (ON), the oil pressure of corresponding W/C2floor-line-2RR is decompressed, and the lock of a wheel is prevented. Moreover, the oil quantity decompressed from W/C2floor-line-2RR is discharged by reservoirs 56 and 58 through reduced pressure control valve 48floor-line-48RR, and makes the brake oil accumulated at reservoirs 56 and 58 flow back to the usual brake system by driving a motor 80 further at this time.

[0041] And when it judges that the lock inclination of a wheel was solved, while making boost control valve 46floor-line-46RR corresponding to the wheel open for free passage (OFF), reduced pressure control valve 48floor-line-48RR is made to intercept (OFF), and the oil pressure of corresponding W/C2floor-line-2RR is made to increase into an antiskid control. In addition, if W/C oil pressure is made to increase rapidly in this case, since a wheel will serve as a lock inclination, both boost control valve 46floor-line-46RR and reduced pressure control valve 48floor-line-48RR are made to intercept (boost control valve 46=ON, reduced pressure control valve 48=OFF), and the state of holding W/C oil pressure is made. And the stability of vehicles is secured, making W/C oil pressure increase gradually and preventing the lock of a wheel by such control.

[0042] Moreover, after the end of an antiskid control, in order to perform the following antiskid control smoothly, the predetermined period motor 80 is driven, and the reservoir 56 and the brake oil in 58 are pumped out.

** Vehicles behavior control (braking force control of front wheels floor line and FR)

If the rear wheels RL and RR which are driving wheels will be in an engine brake state, as the term of a "Prior art" described, vehicles behavior control From there being a possibility that the side force of rear wheels RL and RR may fall, and vehicles behavior may become unstable by load movement It is control for applying the damping force according to load movement to front wheels floor line and FR at the time of engine brake, and making it the damping force of rear wheels RL and RR and the damping force of front wheels floor line and FR serve as a stable zone of the ideal braking-force-distribution diagram shown in drawing 5 that such a phenomenon should be prevented.

[0043] And in this vehicles behavior control, while driving a motor 80 first and operating pumps 60 and 62, the SM valves 50a and 50b and the SR valves 70a and 70b are turned on (energization). that is, -- from the reservoir 68 formed in the upper part of M/C34 as SM valve 50a, a 50b= interception position and SR valve 70a, and a 70b= free passage position -- each -- it considers as the state which can feed a brake oil with pumps 60 and 62 to boost control valve 46floor-line-46RR

[0044] Moreover, in this vehicles behavior control, it responds to degree difference of wheel speed **V of the degree VF of average wheel speed of front wheels floor line and FR, and the degree VR of average wheel speed of rear wheels RL and RR. By ON-OFF [W/C2floor line of front wheels floor line and FR, the increase of oil pressure and boost control valve 46floor line to decompress of 2FR, 46FR, and reduced pressure control valve 48floor line and 48FR], it controls so that the degree VF of front-wheel average wheel speed becomes lower than the degree VR of rear wheel average wheel speed.

[0045] Specifically, boost control valve 46floor line, 46FR, and reduced pressure control valve 48floor line and 48FR are driven, the brake oil pressure of front wheels floor line and FR is suitably switched to a boost, maintenance, and reduced pressure, thereby, the damping force of front wheels floor line and FR is changed, and the degree VF of front-wheel average wheel speed is adjusted on the basis of the degree VR of rear wheel average wheel speed.

[0046] It explains along with the flow chart which is there, next is shown in drawing 3 about the vehicles behavior control processing performed by ECU20 in order to perform such vehicles behavior control. In addition, ON of the ignition switch (illustration ellipsis) of vehicles performs this processing periodically for every predetermined time.

[0047] if vehicles behavior control processing is started as shown in drawing 3 , it will judge first whether driving wheels RL and RR are in an engine brake state now in S110 (S: -- a step is expressed) by judging whether both the accelerator switch 12 and the brake switch 36 are OFF states In addition, this processing (S110) is equivalent to the detection means of this invention (it indicates to a claim 4).

[0048] And the operator is performing accelerator operation or brakes operation, and if it is not among engine brake, the processing concerned is ended as it is and an operator performs neither accelerator operation nor brakes operation conversely, but in being among the present engine brake, it will perform processing after S120 (it is equivalent to the control means of this invention) now.

[0049] In addition, while driving a motor 80 and operating pumps 60 and 62 by the vehicles behavior control processing concerned in order to make controllable brake oil pressure of front wheels floor line and FR when it is judged that driving wheels RL and RR are in an engine brake state in S110, feeding control of the brake oil which turns on the SM valves 50a and 50b and the SR valves 70a and 70b is performed separately.

[0050] Next, in S120, the degree VR of average wheel speed of the right-and-left rear wheels RL and RR is calculated based on the detecting signal from degree sensor of wheel speed 4RL, and 4RR prepared in rear wheels RL and RR. Moreover, in S130 continuing, the degree VF of average wheel speed of the right-and-left rear wheels floor line and FR is calculated based on the detecting signal from degree sensor of wheel speed 4floor line, and 4FR prepared in front

wheels floor line and FR. And it asks for deflection **V (however, **V=VR-VF) of the degree VR of rear wheel average wheel speed and the degree VF of front-wheel average wheel speed for which it asked in S140 continuing S120 and S130.

[0051] In this way, if deflection **V of the degree VR of rear wheel average wheel speed and the degree VF of front-wheel average wheel speed is called for, it will shift to S150 shortly, this deflection **V will be a negative value smaller than "0", and it will judge whether the degree VR of rear wheel average wheel speed is smaller than the degree VF of front-wheel average wheel speed. And that deflection **V shifts to S160 in a negative value when the degree VR of rear wheel average wheel speed is smaller than the degree VF of front-wheel average wheel speed, and only specified quantity **P should boost the brake oil pressure to W/C2floor line of front wheels floor line and FR, and 2FR, boost control valve 46floor line and 46FR are controlled to ON state and reduced pressure control valve 48floor line, 48FR is controlled in the OFF state, respectively, and the processing concerned is once ended.

[0052] It is larger than the 1st decision value KH (positive value) to which it shifted to S170 and deflection **V was beforehand set in S150 on the other hand when it was judged that deflection **V was more than "0", and judges whether the degree VF of front-wheel average wheel speed is small more than the 1st decision value KH from the degree VR of rear wheel average wheel speed. This 1st decision value KH by boosting the brake oil pressure of front wheels floor line and FR in S160 If it is a decision value for judging whether the damping force which joins front wheels floor line and FR was controllable more than the damping force which joins rear wheels RL and RR and deflection **V is below the 1st decision value KH After performing processing of S160, the processing concerned is once ended, and deflection **V shifts to S180 conversely, in being larger than the 1st decision value KH.

[0053] And in S180, the above-mentioned deflection **V is larger than the 2nd decision value KR (positive value) beforehand set as the larger value than the 1st decision value KH, and it judges whether the degree VF of front-wheel average wheel speed is small more than the 2nd decision value KR from the degree VR of rear wheel average wheel speed. This 2nd decision value KH by boosting the brake oil pressure of front wheels floor line and FR in S160 It is a decision value for judging whether the damping force which joins front wheels floor line and FR became large too much to the damping force which joins rear wheels RL and RR. If deflection **V is below the 2nd decision value KR (getting it blocked within the limits from the 1st decision value KH to the 2nd decision value KR) After controlling boost control valve 46floor line and 46FR to ON state and reduced pressure control valve 48floor line, controlling 48FR by S190 in the OFF state and holding the brake oil pressure to W/C2floor line of front wheels floor line and FR, and 2FR in the present state, the processing concerned is once ended.

[0054] Deflection **V conversely moreover, in being larger than the 2nd decision value KR Since there is a possibility that the damping force which joins front wheels floor line and FR may become large too much, front wheels floor line and FR may serve as a lock inclination, and vehicles behavior may become unstable That it shifts to S200 and the brake oil pressure of front wheels floor line and FR should be decompressed, boost control valve 46floor line and 46FR are controlled to ON state and reduced pressure control valve 48floor line, 48FR is controlled in the ON state, respectively, and the processing concerned is once ended.

[0055] thus, in the rear drive vehicle of this example by which vehicles behavior control is performed As shown in drawing 4 , driving wheels (rear wheel) RL and RR go into an engine brake state (time t0), and the degree VR of rear wheel average wheel speed falls. If deflection **V of this and the degree VF of front-wheel average wheel speed becomes a negative value (time t1), **** will boost the brake oil pressure of front wheels floor line and FR, and damping force will be applied to front wheels floor line and FR.

[0056] And if the degree VF of front-wheel average wheel speed becomes lower than the degree VR of rear wheel average wheel speed and the deflection **V becomes large rather than the 1st decision value KH with a boost of this brake oil pressure, the brake oil pressure of front wheels floor line and FR will be held, further, if deflection **V becomes large rather than the 2nd decision value KR, the brake oil pressure of front wheels floor line and FR will be decompressed, and the damping force which joins front wheels floor line and FR will be reduced.

[0057] According to this example, therefore, the damping force which joins front wheels floor line and FR at the time of engine brake The degree VF of front-wheel average wheel speed from the speed (VR-KH) which subtracted the 1st decision value KH from the degree VR of rear wheel average wheel speed It will be controlled to come in the speed range to the speed (VR-KR) which subtracted the 2nd decision value KR from the degree VR of rear wheel average wheel speed. Compared with equipment, vehicles deceleration at the time of engine brake can be enlarged conventionally which does not control the damping force of front wheels floor line and FR at the time of engine brake (refer to drawing 4).

[0058] And in this way, at the time of engine brake, since the damping force which joins rear wheels RL and RR by engine brake, and the damping force more than equivalent are applied to front wheels floor line and FR, the relation between the damping force of rear wheels RL and RR and the damping force of front wheels floor line and FR can be

controlled by this example in the stable zone of the ideal braking-force-distribution diagram shown in drawing 5 , and rolling-stock-run stability can be improved by it.

[0059] As mentioned above, although one example of this invention was explained, this invention is not limited to the above-mentioned example, and can take various modes. For example, although the above-mentioned example explained what applies damping force to a front wheel and improves rolling-stock-run stability at the time of the engine brake of a rear drive vehicle When the side force of a rear wheel falls with load movement produced at the time of engine brake, this invention The side force of a front wheel is reduced by applying damping force to a front wheel, and since it is the thing which makes the lateral force before vehicles and by the side of a rear wheel balance, even if it applies to a four-wheel drive car, rolling-stock-run stability can be improved.

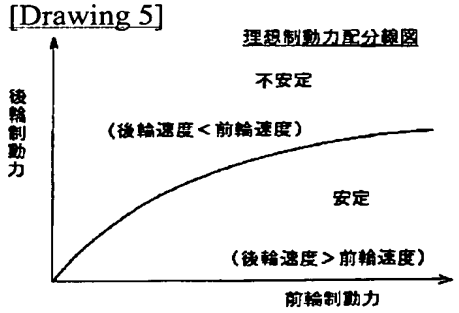
[Translation done.]

* NOTICES *

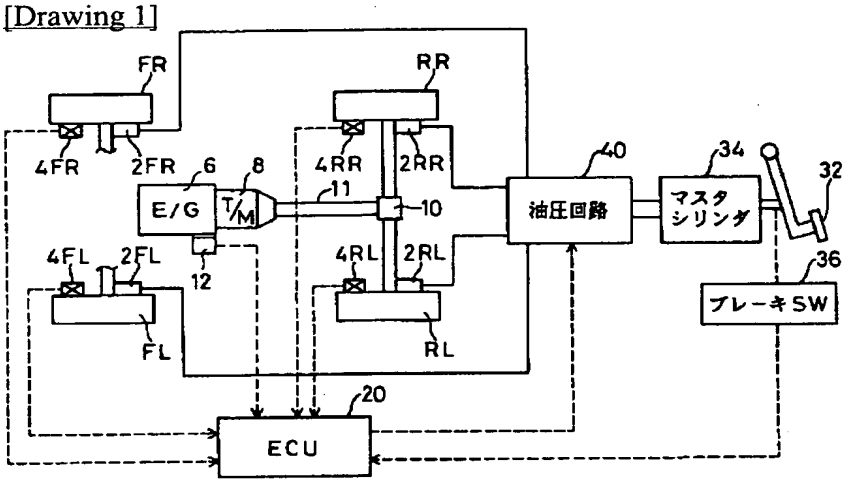
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

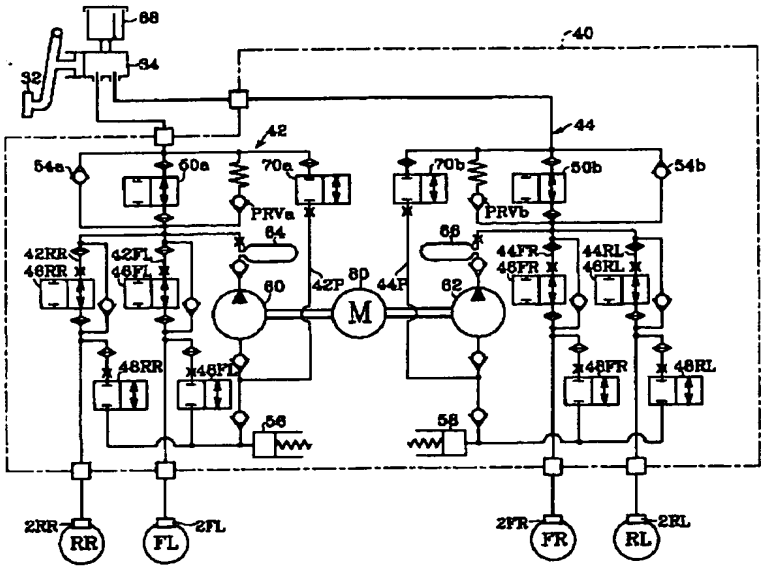
[Drawing 5]



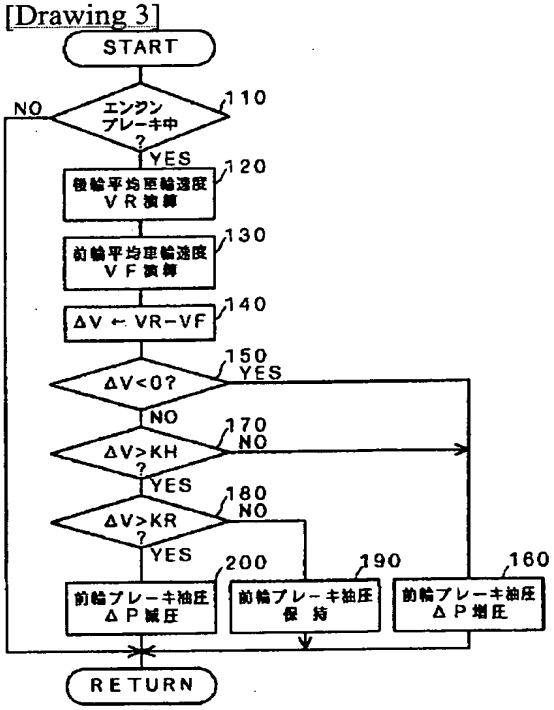
[Drawing 1]



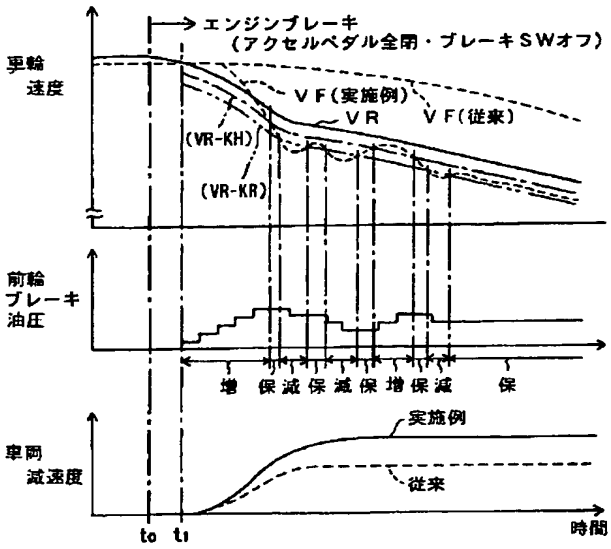
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]